Patient Heterogeneity In Cost-Effectiveness Models for Chronic Obstructive Pulmonary Disease (Copd)

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telemedicine (evaluation of usefulness); • the view of information systems or architectures. The following characteristics were taken: • purpose of the system; • interaction of patients and physicians; • training and impact on lifestyle - the formation of health-preserving behaviors (with the exception of smoking, adequate physical activity, etc.); • self-management. **RESULTS:** The following problems of implementation of telemedicine systems were identified: • high cost, the need to purchase special equipment and devices; • the need for training and motivation of both staff and patients; • lack of a unified architecture, protocol stack and hardware-software platform for the integration of systems at all stages of the process - from data collection to its processing, decision-making and patient feedback. Despite the fair amount of existing telemonitiring systems almost all of its provide only data collection, while the entire analytical part falls on the doctor. Almost all of studies were focused on the elderly and adults. **CONCLUSIONS:** A promising direction is the development of a prototype system for remote health monitoring in pediatric patients. The study was supported by the Russian Foundation for Basic Research, the project ¹ 13-04-12055.

PRM66

USING MACHINE LEARNING TO POPULATE A MARKOV MODEL BY MINING BIG DATA DIRECTLY FROM HOSPITAL EHRS – AN APPLICATION TO DYNAMICALLY PREDICT HOSPITAL-ACQUIRED PRESSURE ULCERS

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OBJECTIVES: Real-world big data accessible through electronic health record (EHR) systems offer opportunities to collect generalizable information to populate economic models. Using a supervised machine learning approach, the objectives were: (a) to mine a hospital EHR for transition probabilities of high-risk patients for developing hospital-acquired pressure ulcers (HAPUs); and (b) to compare efficiency and accuracy of predictive methods between Markov modeling and Bayesian inference with EHR data. **METHODS:** This study used a de-identified panel of patient hospitalizations since 2010 in a U.S. tertiary academic medical center EHR to study Braden scores of patient risk for developing HAPUs. The study focused on patients hospitalized for ≥5 days and at least two Braden scores. Braden scores were converted from an ordered scale into five categories (i.e. minimal risk; at risk; moderate risk; high risk; very high risk). A 10-stage Markov model was constructed via supervised machine learning using R software designating the five Braden categories as transition states, as well as end-states for discharge or HAPU incidence. Results of the Markov approach were age-adjusted and compared to prior probabilities of HAPU risk derived from naïve and full Bayesian inference. Measures of computational accuracy and efficiency were derived to compare analytical approaches. **RESULTS:** The EHR provided a panel of over 34,787 patients. The Markov model yielded transition probabilities for each of 7 transitions. Patient risk for developing a HAPU is highly predictable after approximately 4-6 iterations. The very high-risk cohort had a clinically meaningful increase in risk for HAPU development of 2.35% compared to a minimal risk transition probability of 0.05% ($p<0.001$). Neither of the Bayesian classifiers provided accurate comparisons. **CONCLUSIONS:** Real-world big data from an EHR enables outcomes researchers to mine transition probabilities using supervised machine learning. These results can be obtained to efficiently populate Markov models for cost-effectiveness and decision analysis.

PRM67

BURDEN OF EPILEPSY IN COLOMBIA

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OBJECTIVES: Epilepsy lays an important burden on healthcare systems and society in general. Disability adjusted life years (DALYs) have been developed to compare the burden of this disease both between conditions and between geographical boundaries. With improving data on disease incidence and prevalence in Colombia, we can refine our DALYs-based estimates. **METHODS:** Using different strategies, including the official healthcare provision database (called RIPS) and death certificates, as well as extrapolation from published neuroepidemiologic studies, we estimated the incidence and prevalence by age groups, the disease duration and the attributable mortality. Base don previous studies, we assumed an average disability weight of 0.113. With this information, and using the classic methodology described by Murray & Lopez, we calculated DALYs for the year 2012. **RESULTS:** 49,984 (10.4%) of the 479,836 Colombian epilepsy patients are in the 15-19 year-old group. Overall, it was found that epilepsy was responsible for 0.88% of all deaths (12,837) in Colombia, 8,219 (64%) of them in 60-year olds or older. A total of 5.25 DALYs per 1,000 person-years are lost due to epilepsy in Colombia, 75% of which (3.91 DALYs) are due to premature mortality, with a higher burden in men (6.12 DALYs) than in women (4.41 DALYs). **CONCLUSIONS:** We reported new estimations on epilepsy incidence and prevalence by age groups in Colombia and conclude that DALYs lost due to epilepsy in Colombia are almost double the previous figure, mostly because of the underestimation of attributable mortality. With this figure, epilepsy ranks 12th instead of 19th in the list of the most important causes of DALYs lost.

RESEARCH ON METHODS – Modeling Methods

PRM68

GENERALIZED IMPLEMENTATION OF EM ALGORITHM FOR ESTIMATION OF TRANSITION PROBABILITY MATRIX

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OBJECTIVES: Health economic models typically follow a Markovian framework with discrete health states. The transition probability matrix (TPM), which characterizes the health state transitions, is the key driver of such a model. Estimation of TPM depends upon the observation intervals of clinical studies and the model cycle length. Generally Maximum-Likelihood (ML) or eigen-decomposition method can be used to estimate the TPM. However, these methods are not feasible for studies with non-uniform observation intervals (e.g., observations taken at 1, 3 & 6 months), or when eigenvalues are negative or complex. The current objective is to provide a generalized algorithm to estimate TPM in all possible situations using all the available data. **METHODS:** Craig & Sendi (2002) illustrated an EM algorithm approach to estimate 1 month TPM for a 3-state model, where 1 and 2 month observations were available. We generalized this procedure and created an algorithm for any observation intervals and any number of states. We evaluated this algorithm in the following situations: i) Observations at multiple intervals to estimate a single cycle TPM, ii) Seventh month observed transitions to estimate a 2-month TPM when the eigenvalues are complex, iii) Sixth month observed transitions to estimate a 2-month TPM when the eigenvalues are negative. **RESULTS:** The generalized EM algorithm approach replicated results obtained from ML and eigen-decomposition method. In cases where eigenvalues were negative and complex, this method provided solutions which were valid and interpretable. In all three situations mentioned above, the generalized EM algorithm produced consistent and valid results. **CONCLUSIONS:** A generalized EM algorithm can be a useful tool to estimate TPM, in complex situations where ML estimation and eigen-decomposition cannot be used. It allows the use of all the observed data to estimate the TPM, thus increasing the accuracy of the health economic models.

PRM69

PATIENT HETEROGENEITY IN COST-EFFECTIVENESS MODELS FOR CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD): ARE CURRENT MODELS SUITABLE TO EVALUATE PERSONALIZED MEDICINE

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OBJECTIVES: To assess how suitable current COPD cost-effectiveness models are to evaluate personalized treatment options for COPD by exploring the type of heterogeneity included in current models and by validating outcomes for subgroups of patients. **METHODS:** A consortium of COPD modelling groups participated in three evaluations. First, they reported all patient characteristics included in the model and provided the level of detail in which the input parameters were specified. Second, groups simulated disease progression, mortality, QALYs and costs for hypothetical subgroups of patients that differed in gender, age, smoking status and FEV1% predicted. Finally, model outcomes for exacerbations and mortality for subgroups of patients were validated against published subgroup results of two large COPD trials. **RESULTS:** Nine COPD modelling groups participated. Most models included gender (7), age (9), smoking status (6) and FEV1% predicted (9), mainly to specify disease progression and mortality. Almost all input parameters were specified by FEV1% predicted. In addition, disease progression was higher for females and smokers in three and five models, respectively and costs were higher for older patients in three models. Differences between subgroups on other parameters were more variable between the models. Trial results showed higher exacerbation rates for females, which was found in one model, higher mortality rates for males (found in two models), lower mortality for younger patients (found in four models), and higher exacerbation and mortality rates in severe COPD compared to moderate COPD patients (found in four models). **CONCLUSIONS:** The majority of currently available COPD cost-effectiveness models are able to evaluate the cost-effectiveness of personalized treatment based on gender, age, smoking and FEV1% predicted. Treatment in COPD is however, more likely to be personalized based on clinical parameters. Two models include several clinical patient characteristics and seem most suitable to evaluate personalized treatment, although some important clinical parameters are still missing.

PRM70

MODELING THE BURDEN OF ABDOMINAL AORTIC ANEURYSM (AAA) IN EUROPE IN 2013

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OBJECTIVES: To estimate the number of prevalent cases of abdominal aortic aneurysm (AAA) and deaths attributable to AAA in five major European Union (5EU) markets: France, Germany, Italy, Spain, and the United Kingdom (UK). **METHODS:** We used disease modeling software, DisMod II (World Health Organization), to assess AAA burden via a multi-state life table where differential equations define relationships between incidence, prevalence, and disease-specific mortality. Market-specific input data included age- and sex-specific population structure, age- and sex-specific all-cause mortality, and cubic spline interpolation of size- and sex-specific AAA prevalence. Other input data consisted of relative risk (RR) estimates of death for persons with AAA compared with persons without AAA, adjusted for age, ethnicity, height, weight, smoking, and cardiovascular disease history. **RESULTS:** We estimated 2,484,058 prevalent cases in the 5EU in 2013 (90% CI: 2,282,702–2,638,106), resulting in 48,805 deaths attributable to AAA (90% CI: 39,924–54,291). In the combined 5EU, females accounted for 20.2% of prevalent cases and 43.2% of deaths. France had the lowest number of prevalent cases (581.8 per 100,000 population) and deaths (11.0 per 100,000 population) among the 5EU markets, while Italy had the highest number of prevalent cases (1,103.7 per 100,000 population) and deaths (22.3 per 100,000 population). The number of